

The Physico-chemical Characteristics of Surface and Ground Water of BALCO Industrial Area of Korba City

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Abstract: An investigation was carried out to examine the physical and chemical properties of surface and ground water quality of BALCO industrial area in Korba City. Ten different locations were selected for the study and water sample were collected in 2litres capacity of polyethylene bottles (Jan 2015) from various sampling point viz. Budhawari basti, ITI chowk, Irrigation colony, Parasabhata, Duggupara, Bhrapara, Mungda, Sitamani, Risda, and Daihanpara. The parameters studied were pH, Total Alkalinity, Total Hardness, Total Acidity, Calcium and Magnesium Hardness, Total Dissolved solids and Conductivity. Result lies between viz. pH 5.55-8.46, TDS 100-390ppm, total hardness 82-238ppm, total alkalinity 20-130ppm, total acidity 10-80ppm.

1. INTRODUCTION

Environmental pollution is the result of explosive population, indiscriminate urban industrialization and vast application of chemical fertilizers and pesticides in agriculture, water source are getting undesirable foreign substances and resulting for human consumption.

Water pollution in developing countries, developed countries continue to struggle pollution problem as well. The Specific contaminants leading to pollution in water include a wide spectrum of chemicals, pathogens, and physical changes such as elevated temperature and discoloration [1]. Water is an important parameter for the development of any nation it is directly related to growth of the economy.

Chhattisgarh is the richest Indian state in natural resources such as Coal, Bauxite and iron. The coal based thermal plants such as NTPC, CSEB, and BALCO are established at industrial hub, Korba due to rich raw materials. Balco is situated about 8km in north – east direction from Korba, district head quarter. The ground water of Korba is continuously degrading due to industrial activities and the soils of the nearby fields are also being affected [2-6]. The aim of

study is to monitoring of water sources by physico-chemical parameters.

2. MATERIAL AND METHODS

2.1 Location

Korba industrial area is part of Korba district situated at 22-22' N and 82-42'E latitude with the 308.4 meter above sea level.

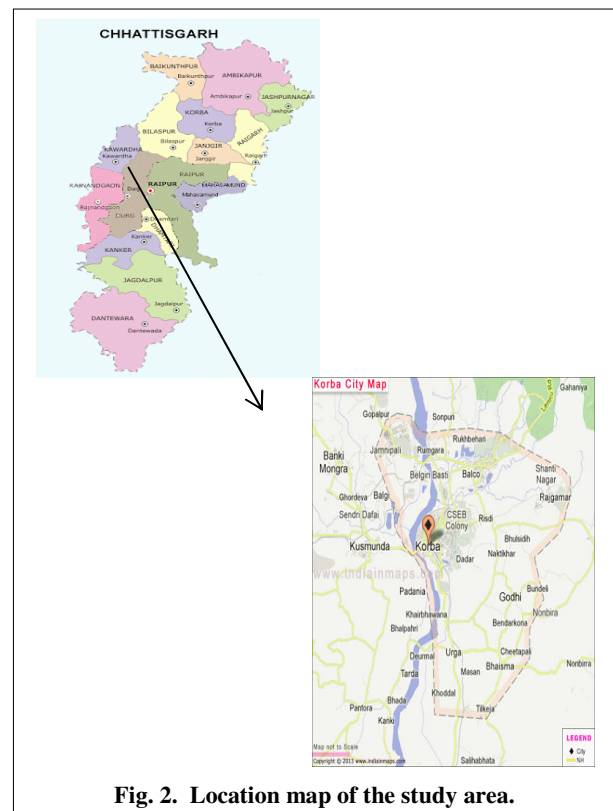


Fig. 2. Location map of the study area.

2.2 Collection of Water Samples

All Surface and Ground water samples are collected from 10 different location of Korba industrial area in polyethylene cans of 2L capacity for physico chemical analysis on January 2015 between 9am to 6pm.

The physical parameters i.e. pH, TDS and EC values were determined at the spot immediately after collection. For physico chemical analysis water samples were kept in refrigerator maintained at 4 degree Celsius temperature. These samples were tested for physico-chemical parameters like pH, EC, Total dissolved Solids, Total hardness, Calcium and Magnesium hardness, Total alkalinity, Total acidity and Dissolved oxygen.

TABLE 1: Collection sites of water samples

| S.No | Name of the Sampling sites | Sample Identification No |
|------|----------------------------|--------------------------|
| 1. | Budhawari Basti | G-1, S-1 |
| 2. | ITI Chowk | G-2, S-2 |
| 3. | Irrigation Colony | G-3 |
| 4 | Parasabhata | G-4, S-7 |
| 5 | Vanopaj Chowk Naka | G-5, S10 |
| 6 | Duggupara | G-6, S-5 |
| 7 | Bhdrapara | G-7, S-6 |
| 8 | Risda | G-8, S-3 |
| 9 | Bhdrapara (check post) | G-9, S-9, S-4 |
| 10 | Mungda | G-10, S-8 |

2.3 Analysis of physico-chemistry parameters

In the analysis, the pH of samples was measured with the help of digital pH meter. Electrical conductivity was measured by conductivity meter, TDS was measured with the help of

Digital TDS meter. The hardness hardness and alkalinity are determined by titration method.

3. RESULT AND DISCUSSION

3.1 Physico-Chemical parameters for Surface Water

The results of physico-chemical pertinent characteristics such as pH, EC, Total Dissolve Solid, Total hardness, Calcium and magnesium hardness, Total acidity, total alkalinity and dissolved oxygen for various samples collected in month of January period from various sites the surface korba industrial area are given in Table 2. The obtained result of all the samples pH are in the range of 6.5 to 8.46 , EC are in the range of 0.08 to 0.78ms, TDS are in the range of 40 to 160ppm, Total hardness are in the range of 63.63 to 130.08ppm, Calcium hardness are in the range of 16 to 84ppm, Magnesium hardness are in the range of 23.2 to 45.60ppm, Total acidity are in the range of 8.92 to 17.85ppm , Total alkalinity are in the range of 43.20 to 129.60ppm , Dissolved oxygen are in the range of 5.48 to 12.02ppm.

3.2 Physico-Chemical parameters for ground Water

The results of physico-chemical pertinent characteristics such as pH, EC, Total Dissolve Solid, Total hardness, Calcium and magnesium hardness, Total acidity, total alkalinity and dissolved oxygen for various samples collected in month of January period from various sites the groundwater korba industrial area are given in Table 3. The obtained result of all the samples pH are in the range of 6.5 to 8.46 , EC are in the range of 0.08 to 0.95ms, TDS are in the range of 40 to 470ppm, Total hardness are in the range of 77.76 to 194.40ppm, Calcium hardness are in the range of 40 to 180ppm, Magnesium hardness are in the range of 25.44 to 80.96ppm, Total acidity are in the range of 8.92 to 80.35ppm, Total alkalinity are in the range of 45.45 to 130.09ppm, Dissolved oxygen are in the range of 3.29 to 7.68ppm.

TABLE 2. Physico-Chemical parameters for Surface Water

| Parameters | Surface Water Sample | | | | | | | | | |
|------------------------------|----------------------|-------|--------|-------|--------|--------|-------|-------|--------|--------|
| | S-1 | S-2 | S-3 | S-4 | S-5 | S-6 | S-7 | S-8 | S-9 | S-10 |
| pH | 7.80 | 7.75 | 7.50 | 7.30 | 8.46 | 6.50 | 7.20 | 7.55 | 7.52 | 6.73 |
| Electrical conductivity (ms) | 0.32 | 0.15 | 0.24 | 0.09 | 0.78 | 0.13 | 0.08 | 0.14 | 0.09 | 0.09 |
| Total dissolved solid (ppm) | 160 | 70 | 120 | 40 | 390 | 60 | 40 | 70 | 40 | 40 |
| Total Alkalinity (ppm) | 120.96 | 43.20 | 129.60 | 73.44 | 108.00 | 69.12 | 60.48 | 47.52 | 112.32 | 64.80 |
| Total Acidity (ppm) | 17.85 | 8.92 | 17.85 | 13.39 | 22.32 | 44.64 | 13.39 | 13.39 | 17.85 | 13.39 |
| Total hardness (ppm) | 129.70 | 68.18 | 99.99 | 86.35 | 130.08 | 113.62 | 63.63 | 90.90 | 22.73 | 113.62 |
| Calcium Hardness (ppm) | 80 | 20 | 84 | 40 | 80 | 36 | 28 | 16 | 84 | 32 |
| Magnesium Hardness (ppm) | 40.96 | 23.20 | 45.60 | 33.44 | 28.00 | 33.12 | 32.48 | 31.52 | 28.32 | 32.80 |
| Dissolved Oxygen (ppm) | 8.77 | 8.78 | 9.87 | 9.87 | 6.58 | 7.68 | 12.06 | 5.48 | 4.38 | 6.58 |

TABLE 3: Physico-Chemical parameters for Ground Water

| Parameters | Ground Water Sample | | | | | | | | | |
|------------------------------|---------------------|--------|--------|--------|-------|--------|--------|--------|--------|--------|
| | G-1 | G-2 | G-3 | G-4 | G-5 | G-6 | G-7 | G-8 | G-9 | G-10 |
| pH | 5.55 | 6.28 | 7.08 | 7.16 | 5.82 | 6.08 | 7.21 | 7.41 | 7.15 | 6.36 |
| Electrical conductivity (ms) | 0.28 | 0.20 | 0.95 | 0.52 | 0.25 | 0.53 | 0.46 | 0.22 | 0.08 | 0.42 |
| Total dissolved solid (ppm) | 140 | 100 | 470 | 260 | 120 | 270 | 230 | 110 | 40 | 70 |
| Total Alkalinity (ppm) | 194.40 | 73.44 | 237.60 | 112.32 | 77.76 | 237.60 | 129.60 | 120.96 | 82.08 | 228.96 |
| Total Acidity (ppm) | 8.93 | 80.35 | 22.32 | 17.85 | 22.32 | 13.39 | 17.85 | 13.39 | 8.92 | 35.71 |
| Total hardness (ppm) | 45.45 | 113.63 | 128.60 | 130.09 | 77.26 | 49.99 | 129.90 | 130.06 | 130.00 | 45.45 |
| Calcium Hardness (ppm) | 152 | 48 | 180 | 80 | 44 | 180 | 88 | 108 | 40 | 148 |
| Magnesium Hardness (ppm) | 42.40 | 25.44 | 57.60 | 32.32 | 33.76 | 57.60 | 41.60 | 20.96 | 42.08 | 80.96 |
| Dissolved Oxygen (ppm) | 5.48 | 4.38 | 3.29 | 3.29 | 5.48 | 7.68 | 5.48 | 3.29 | 7.68 | 4.38 |

4. CONCLUSION

The present study was to evaluate the physico-chemical parameters such as pH, EC, Total dissolved Solids, Total hardness, Calcium and Magnesium hardness, Total alkalinity, Total acidity and Dissolved oxygen in surface and ground water of the 10 different sites of BALCO, Industrial area Korba city.

The result reveals that the surface and ground water of all the sites were found over the permissible limit as per BIS[7] and WHO[8] recommendations. Further, the study also includes the removal technique for the suitability of surface and ground water for drinking in study area.

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